

REMARKS

Claims 1-20 are in this application and are presented for consideration. By this amendment, Applicant has amended claims 1, 2 and 7 for minor details. It is Applicant's position that the changes to the claims do not materially alter the scope of the claims and do not raise any new issues.

Claims 1, 3 and 11-14 have been rejected under 35 U.S.C. 102(b) as being anticipated by JP 2002-195247 (hereinafter "JP '247").

The present invention relates to a hinge device for connecting one member and another member such that the members can be opened and closed. The hinge device comprises a leaf spring member and a fixing plate. The leaf spring member has a curved portion and the fixing plate has at least two protrusions that are located on a surface thereof. The leaf spring member and the fixing plate are inserted onto the movable shaft such that they are pressed into contact with each other for relative rotation therebetween. When the curved portion of the leaf spring member is overlapped with the protrusions of the fixing plate, the leaf spring member is compressed. This advantageously produces a large rotational torque. When the curved portion of the leaf spring member and the protrusions of the fixing plate are located at a distance from one another, a small rotational torque is generated. The rotational torque is transmitted to the movable shaft via the leaf spring portion and the fixing plate.

JP '247 discloses a hinge device having a hinge shaft 23. The shaft 23 includes the shaft 27 and a larger diameter portion 28. The larger diameter portion 28 is accommodated within the cover 22. The shaft 27 protrudes outward with respect to the cover 22. A leaf spring 24

of circumferentially corrugated configuration and spheres 25 are disposed in contact with one another. When the hinge shaft 23 rotates, one of the leaf spring 24 and the spheres 25 is rotated together with the hinge shaft 23 while the other is not rotated. When the hinge shaft 23 is rotated, the leaf spring 24 of circumferentially corrugated configuration is elastically deformed by the spheres 25 and the larger diameter portion 28 of the hinge shaft 23 is pressed against the inner surface of the cover 22, whereby torque is generated in the hinge shaft 23. When the leaf spring 23 is elastically deformed by the spheres 25, the contact pressure between the leaf spring 24 and the spheres 25 changes in accordance therewith, and hence torque is generated in this case as well. However, the leaf spring 24 and the spheres 25 are held in rolling contact with each other, and the torque generated in this case is small (paragraph [0020]). As such, torque is mainly generated by pressing the larger diameter portion 28 of the hinge shaft 23 against the inner surface of the cover 22.

JP '247 fails to teach and fails to suggest the combination of a leaf spring member and a fixing plate that are pressed into contact with each other for relative rotation therebetween. According to the present invention, rotational torque is transmitted to a movable shaft wherein the torque is generated by the relative rotation between the leaf spring member having a curved portion therein and a fixing plate that has protrusions that are pressed into contact with the leaf spring. JP '247 takes a completely different approach from the present invention. JP '247 merely discloses that a larger diameter portion 28 of a hinge shaft 23 is pressed against an inner surface of a cover 22 to generate rotational torque, i.e. the rotational torque is directly generated in the hinge shaft 23. This disadvantageously makes the cover 22 an essential

element of the hinge device of JP '247. In contrast to JP '247, the leaf member and the fixing plate are inserted onto a movable shaft. This advantageously provides a simple and less complicated design than that of JP '247 as the present invention does not require a cover as featured in JP '247. JP '247 fails to disclose such a simple hinge arrangement that generates large rotational torques since JP '247 discloses a cover 22 that accommodates a larger diameter portion 28 of a hinge 23, a leaf spring 24 and spheres 25 to press the large diameter portion against an inner surface of the cover 22. This is a completely different approach than a leaf spring member that is pressed into contact with a fixing plate as featured in the present invention. As such, the prior art as a whole fails to disclose each feature of the claimed combination.

Further, JP '247 fails to teach or suggest the combination of a leaf spring member having a curved portion that is axially movably inserted onto a movable shaft and a fixing plate that is inserted onto the movable shaft such that the fixing plate does not rotate when the movable shaft rotates. According to the present invention, the fixing plate is axially movable and the fixing plate has a surface that defines at least two protrusions that are in contact with the leaf spring member. JP '247 fails to disclose a leaf spring member and a fixing plate that are movable in an axial direction of a movable shaft such that the pressure contact force between the spring member and the fixing plate can be adjusted. JP '247 is completely void of any teaching or suggestion for such an adjustment mechanism feature. In fact, JP '247 does not teach or suggest a fixing plate that has a surface that defines two protrusions as claimed. The Office Action refers to the fixing plate as reference number 43 of JP '247 and refers to the two

protrusions as reference number 25 of JP '247. This is improper as reference number 25 of JP '247 refers to spheres 25 which are not defined by a surface of the receiving part 43. In contrast to JP '247 the leaf spring member and the fixing member of the present invention are plates. This advantageously reduces the space in the longitudinal direction to provide a hinge device that is extremely space efficient and compact. The fact that the spring member and the fixing plate of the present invention are plates is significant in the present invention because it allows the protrusions and recesses of the plates to be easily manufactured via sheet metal working, pressing or injection molding. JP '247 fails to disclose such simple manufacturing advantages or such space efficiency advantages since JP '247 only discloses a cover 22 and spheres 25 in which a larger diameter portion 28 of a hinge shaft 23 is pressed against an inner surface of a cover 22. As such, the prior art as a whole takes a completely different approach and fails to provide any teaching or suggestion for each feature of the claimed combination. Accordingly, Applicant respectfully requests that the Examiner favorably consider claim 1 as now presented and all claims that respectively depend thereon.

Claims 1 and 5 have been rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2002-030852 (hereinafter "JP '852").

JP '852 discloses a hinge shaft 1 fixed to a member on one side. A base member 2 is rotatably inserted on to the hinge shaft 1 and fixed to a member on the other side. A spring member 3 is axially movable inserted onto hinge shaft 1 and is restrained from being rotated and pressed against the base member a regulating member 4. The contact surface between the base member 2 and the spring member 3 is formed on the cam 2b. When the hinge shaft 1 is rotated,

the spring member 3 is rotated in synchronism therewith. Thus, the spring member 3 is elastically deformed by the contact surface on the cam 2b with respect to the base member 2 and the contact pressure on the contact surface with respect to the base member 2 is changed, whereby torque is generated in the hinge shaft 1.

JP '852 fails to teach and fails to suggest the combination of a fixing plate that is inserted onto a movable shaft such that the fixing plate is axially movable and does not rotate when the movable shaft rotates. The Office Action takes the position that JP '852 teaches that it would be obvious to separate a fixing plate from a shaft. Applicant respectfully disagrees with such an interpretation of JP '852. A reference must be given a fair reading for what it teaches and suggests. JP '852 provides absolutely no teaching or suggestion for cutting off the cam 2b from the base member 2. The base member 2 of JP '852 is fixed to the member on the other side, has a short cylindrical configuration and is provided with a shaft hole 2a through the axial center thereof. The base member 2 is formed with a non-circular configuration portion 2c on an outer surface thereof and is further formed with a V-shaped groove 2b as a cam on the one end surface thereof. As such, JP '852 fails to provide any teaching that would direct the person of ordinary skill in the art toward separately cutting off the cam 2b of the base member 2. In contrast with JP '852, the fixing plate of the present invention advantageously reduces the amount of space in a longitudinal direction. This advantageously provides a hinge device that is smaller and easier to manufacture. In fact, JP '852 discloses that the base member 2 is fixed to the member on the other side. In contrast with JP '852 the fixing plate of the present invention is not fixed to the member on the other side. According to the present invention, the

leaf spring member having the curved portion and the fixing plate having at least two protrusions are pressed into contact with each other for relative rotation therebetween, so that a large rotational torque is advantageously generated. This advantageously provides smooth torque characteristics (see torque characteristic diagrams of Figs. 9, 11, and 13 in the specification), and the positions, numbers, and sizes of the protrusions of the fixing plate can be appropriately selected so that various torque characteristics are advantageously obtained. In contrast to the present invention, the clicking sensation of JP '852 is produced when the V-shaped groove (cam) 2b of the base member 2 is fitted with the angular protrusion 3b of the spring washer 3. This disadvantageously produces an abrupt torque change when the device is rotated into the fitted state since JP '852 fails to disclose a fixing plate as claimed. As such, the prior art as a whole takes a different approach and fails to direct the person of ordinary skill in the art toward each feature of the claimed combination. Accordingly, Applicant respectfully requests that the Examiner favorably consider claim 1 as now presented and all claims that depend thereon.

Claim 2 has been rejected under 35 U.S.C. 103(a) as being unpatentable over JP '247.

As previously discussed above with regard to claim 1, JP '247 fails to provide any teaching or suggestion for a fixing plate as claimed. JP '247 does not disclose a separate fixing plate as claimed and fails to provide any suggestion for modifying the base member 2 to form a fixing plate as claimed. As such, the prior art as a whole fails to direct the person of ordinary skill in the art toward the features claimed. Accordingly, Applicant respectfully requests that the Examiner favorably consider claim 2 as now presented.

Claims 6-10 have been rejected under 35 U.S.C. 103(a) as being unpatentable JP '852, and further in view of JP 2001-041228 (hereinafter "JP '228").

The tilt hinge according to JP '228 includes an attachment member 1. A rotatable shaft 2 is rotatably attached to the attachment member 1. A first friction washer 4 is inserted onto the rotatable shaft 2. The hinge further has a second friction washer 6, a spring washer 7, and a press washer 8. When the washer 8 side of the rotatable shaft 2 is swaged, the second friction washer 6 and the first friction washer 4 are pressed into contact with the spring washer 7 and the bearing plate 1b of the attachment member 1, respectively. When the rotatable shaft 2 is rotated, friction torque is generated between the second friction washer 6 and the spring washer 7 and between the first friction washer 4 and the bearing plate 1b of the attachment member 1. A reinforcing plate 5 is provided on one of the sides of the bearing plate 1b. The reinforcing plate 5 is rotatable together with the rotatable shaft 2 and applied with elasticity. A suction mechanism is provided between the reinforcing plate 5 and the attachment member 1.

JP '852 and JP '228 fail to teach and fail to suggest the combination of at least two protrusions defined on a surface of a bracket wherein the protrusions are in contact with a leaf spring member. The Office Action takes the position that the bracket 1 of JP '228 has at least two protrusions as featured in the present invention. Applicant respectfully disagrees with this interpretation of JP '228 as the bracket 1 of JP '228 does not have any protrusions that are in contact with the spring washer 7. JP '228 merely discloses that the spring washer 7 is in contact with a first friction washer 4 and not the bracket 1 as claimed. This is clearly shown in Drawing 4 of JP '228. In contrast to JP '228, the leaf spring member of the present invention is pressed

into contact with the bracket for rotation therebetween. This advantageously allows a large rotational torque to be generated. JP '228 fails to disclose such advantages since the bracket 1 of JP '228 does not have any protrusions in contact with the spring washer 7 as claimed. As such the prior art as a whole fails to provide the person of ordinary skill in the art with any teaching or suggestion for the features of the claimed combination. Accordingly, Applicant respectfully requests that the Examiner reconsider the rejection and favorably consider claims 6 and 8 and all claims that respectively depend thereon.

Claim 4 has been rejected under 35 U.S.C. 103(a) as being unpatentable over JP '852, and further in view of JP '247. Although JP '247 discloses a hinge device comprised of a square cylinder-shaped cover 22 forming an opening 26, the references as a whole fail to suggest the combination of features claimed. Specifically, the references as a whole fail to provide any suggestion or teaching for the combination of a fixing plate that does not rotate when a movable shaft rotates. As such, the references do not suggest the invention and therefore all claims define over the prior art as a whole.

Claims 15-20 have been rejected under 35 U.S.C. 103(a) as being unpatentable over JP '852, JP '247 and JP '228 in view of Chung (U.S. 6,163,928). Although Chung discloses a hinge device, the references as a whole fail to suggest the combination of features claimed. Specifically, the references as a whole fail to provide any suggestion or teaching for the combination of a fixing plate that does not rotate when a movable shaft rotates. Although Chung discloses a nut connected to a threaded end of a shaft, Chung provides no teaching or suggestion for a non-rotatable fixing plate. As such, the references do not suggest the invention

and therefore all claims define over the prior art as a whole.

Favorable consideration on the merits is requested.

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